are chromolithographed from the author's own drawings, which appear to be exceedingly well done. We defer a more extended notice until more parts shall have appeared, especially because the subjects illustrated in the first part are almost the least difficult for the chromolithographic process. The text is clearly printed, but a little more care in writing the short descriptions should be exercised. Thus at the very commencement we read as one of the characters of the family *Papilionidæ*, "Larva cylindrical, not spiny, furnished with two retractile tentacles on the second segment." We doubt if this is correct for *all* the European species of *Papilio;* it certainly is not so if exotic species of the same genus are considered; and almost immediately afterwards the author, in defining the genus *Thais* (one of the *Papilionidæ*), says, "Larvæ armed with spines." Nowhere do we find any reference to the veining of the wings, which certainly should have formed part of the sketch of the principal groups given in the Introduction. The author will do well to consider the importance of this suggestion. We presume the chief object of the work is to enable collectors of European butterflies to name their captures, and especially by means of the figures. For this purpose it promises to be exceedingly well adapted.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

Chemical Equivalents

Mr. J. P. O'Reilly's paper in your last number (p. 274) appears to involve a complete misconception of the theory of chemical equivalents. The equivalents are mere ratios, and are not altered by multiplying their representative numbers throughout by any factor, whether π or any other.

In fact we may write the equivalents of hydrogen, carbon, and oxygen as x, $12x$, and $16x$, without troubling ourselves about the value of x. This is not only the theoretical view, but the one actually used in practice. So far, there is nothing new or special about writing, as Mr. O'Reilly does, $x = \frac{1}{3}\pi$.

But then Mr. O'Reilly goes wrong, and gets results which contradict his hypothesis. When he writes $H = \frac{1}{3}\pi$, and $O = 5\pi$, the real inference is that the equivalents of H and O are as 1 : 15, instead of as 1 : 16 which he started from.

If his π-values are to be taken as corresponding with the equivalents, this simply means that the latter are not to be depended upon within a limit of error of 5 per cent. I think the mistake is not in this respect, but in overlooking the circumstance that the chemical equivalents are not absolute values, but ratios.

July 24 C. W. M.

Slow Lightning

Having just seen the statement of Prof. Tait (Nature, vol. xxii. p. 341) quoted, as a final authority, against the possibility of distinguishing the source from the termination of a lightning flash, I wish to record a storm that I saw. On May 19 there had been a brisk, hot south-west wind blowing at Gizeh, off the Libyan Desert, at about or over 100° F.; at near sunset a north wind began to come up against it, and there was heavy thunder and lightning all along the line of the mingling of the winds, extending as far as I could see to east and west, and passing a few miles to the north of the Pyramids: the lightning was solely between the clouds, at a height of about one and a half miles; the air around me was 94°, though almost dark. I sat on a rock in front of the door of my tomb (from which I could see eighteen miles over the Delta) and quietly watched the lightning. To my sight there were distinctly differences in the duration of the flashes: some appearing instantaneous and others in which I could see a spot of light occupying an appreciable interval to travel from one cloud to another; and I should be puzzled to draw a hard and fast line between the classes. Does this moving spot-lightning merge insensibly into the variation, of which I saw a fine case years ago near Guildford, where a spark would slowly sail down in the air and then move over the ground before it disappeared?

In any case can these slow flashes (lasting perhaps half a second), seen as well as instantaneous flashes, be disposed of by that blessed word *subjectivity*, which is so comforting to theorists on many objects? Or may not the confession of our ignorance of the cause of ball-lightning be extended to slow flashes in general, instead of treating them just as meteorites were put out of court a century ago? W. M. Flinders Petrie

Bromley, Kent

[Several instances are recorded by Faraday, Joule, and others of flashes which seemed to last for a sensible time. But they are easily explained by one or other of two *veræ causæ*, viz. (1) oscillatory discharges along the same path, succeeding one another at smaller intervals than one-seventh of a second; or (2) phosphorescent matter in the track of the flash. More definite particulars would be necessary before one could decide which was active in the present case.—Ed.]

Thought-Reading

As having a bearing upon the hypothesis that in "thought-reading" the information is transmitted by unconscious muscular exertion, allow me to state a modified form of the experiment I tried in the presence of two or three others with Mr. J. R. Brown, who, a few years ago, attracted considerable attention in various parts of the United States by doing precisely what is related of Mr. Bishop in your issue of June 23 (p. 171). After witnessing experiments of the same kind as those stated by Mr. Romanes and performed under the same conditions, I thought to vary them by using a flexible copper wire as a connecting medium. Selecting one, two or three yards long, I held one end in my hand, while Mr. Brown, winding the other end once or twice around his fingers, held it against his forehead, the wire being all the time kept slack between us. Here evidently there could have been no indications received through muscular movements. Yet in this way Mr. Brown would find things concealed or go to certain points determined upon, though apparently with not quite the same readiness and confidence as when the subject's hand was placed against his forehead. Once he partially failed, selecting, instead of a particular spot on the wall I had fixed my mind upon, a small object near it. The experiment in this form was tried with another as his subject, and with equal, if not better, success. Geo. B. Merriman

Rutger's College, New Jersey, July 11

Optical Phenomena

The photographic halo phenomena described in Nature, vol. xxiv. p. 260, seem analogous to some observed by me, and upon which, in the spring, I read a paper (since published in the *Notices*, vol. xli. No. 6) before the Royal Astronomical Society. In this I described that not only the sun's disk and the moon's full and partial phases, but also apertures (of similar shape to these) in the shutter of a dark room, when photographed, were, one and all, surrounded by a strong ring halo not visible to the eye. A correspondent essayed some time since to prove in your journal that this halo only surrounded the moon when at full, but on trial the question proved one of time of exposure; and it now seems pretty clear that whatever may be its form and nature, a very bright object when photographed (especially in relief against a dark ground) is found, if sufficient exposure be given, surrounded on the plate by a halo separated from the object by a dark space. Mr. Cowper Ranyard and others attribute these halos to reflection from the back of the plate, a point on which I have not experimented. The dark spot mentioned in connection with the aperture in the rock is probably a reversal of the brightest light owing to the length of exposure.

In two seconds, with Wratten and Wainwright's instantaneous plates, I have found the sun's image so reversed in a camera landscape, showing as a white spot on the negative and a black dot when printed. J. Rand Capron

Guildown, July 23

Symbolic Logic

Mr. McColl still expresses surprise at my declining to answer a Yes or No question which he was pleased to put to me in

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NATURE (vol. xxiv. p. 124). It was, I should think, almost unique in a scientific journal. It turned upon a contradiction which he had detected between a statement which I never made and the fact that he surely entertained an impression that he had somewhere or other (he did not say where) seen me quoted as holding an opinion at variance with that statement. I did not think that time would be well employed in answering it. Even now he talks of his "quotation or misquotation"; a convenient but unusual latitude of expression for a serious case of the latter of these alternatives. Really I am not in the examination-room, and will not therefore attempt to compress into a few paragraphs the answers I should give upon intricate philosophical points, even were the questions reasonably framed. Moreover I must remind Mr. McColl that he does not profess to write as an impartial inquirer or critic, but asked for the insertion of his letter upon the ground that he conceived himself to have been attacked. I have fully explained the only point upon which he had any claim to call for an answer, and therefore now close the correspondence. J. VENN

Achensee, Tirol

Jupiter

THE great red spot on the planet seems unchanged as I saw it on July 8, while the north temperate zone belt (Gledhill's No. 2) shows a development nearly as striking as the equatorial belts.

Millbrook, Tuam, July 20 J. BIRMINGHAM

New Red Variable

THIS star, which I found on May 22 only 9 magnitude (see NATURE, vol. xxiv. p. 164), progressively increased up to 8 m. on June 6, and is now again no more than 9. Its deep crimson colour is unchanged. It is 2° 51′·7 north of α Cygni, and forms, with three other stars, the southern end of a little inverted and irregular cross. It will probably decrease to complete disappearance, at least from telescopes of moderate power.

Millbrook, Tuam, July 20 J. BIRMINGHAM

A Fireball

ON Wednesday the 20th ult., about midnight, a house at Mont Dore, in the Auvergne, was destroyed by a fireball during a severe thunderstorm. My brother, who has lately arrived from thence, did not see the ball himself, but his valet, an intelligent Italian, saw it distinctly. He describes it as a globe of fire about half a metre in diameter, which approached the house obliquely, seeming to pass over a distance of 200 metres in about half a minute. It entered the door of the house and there burst. My brother heard the explosion as well as his valet, and describes it as a dull thud like that of a smothered blast. The house, which was a wooden one, was set on fire, a child burnt to death, and another inmate seriously, if not mortally, injured. Several inhabitants of Mont Dore are said by the valet to have seen the ball, one of whom lived in the adjacent house.

It will be interesting to readers of NATURE to compare the accounts given by Prof. Tait in NATURE, vol. xxii. p. 409.

19, The Boltons, S.W. JOHN TENNANT

Meteor

ON July 23, at 7.15 p.m. (Irish railway time) a meteor passed, travelling nearly from south to north, being lost in a bank of black cloud. It must have been of considerable brilliancy, as it was quite distinct, although at the time the sun was well above the horizon. July 22 from ten to fourteen brilliant red pencils and thin columns of auroric lights were rising at intervals. There were also auroric lights on July 23 between 11 and 12, but much less brilliant. G. H. KINAHAN

Ovoca, July 24

THE COMET

WE have received the following further communications on this subject:—

The following "Preliminary Note on the Photographic Spectrum of Comet *b* 1881," has been communicated to the Royal Society by Dr. Huggins, F.R.S. (For Dr. Huggins's first note on this subject, see NATURE of June 30.)

ON the evening of June 24, I directed the reflector furnished with the spectroscopic and photographic arrangements described in my paper "On the Photographic Spectra of Stars" (*Phil. Trans.*, 1880, p. 669) to the head of the comet, so that the nucleus should be upon one half of the slit. After one hour's exposure the open half of the slit was closed, the shutter withdrawn from the other half, and the instrument then directed to Arcturus for fifteen minutes.

After development, the plate presented a very distinct spectrum of the comet, together with the spectrum of the star, which I have already described in the paper referred to above.

The spectrum of the comet consists of a pair of bright lines in the ultra-violet region, and a continuous spectrum which can be traced from about F to some distance beyond H.

The bright lines, a little distance beyond H, with an approximate wave-length from 3870 to 3890, appear to belong to the spectrum of carbon (in some form, possibly in combination with hydrogen), which I observed in the spectra of the telescopic comets of 1866 and 1868.

In the continuous spectrum shown in the photograph, the dark lines of Fraunhofer can be seen.

This photographic evidence supports the results of my previous observations in the visible spectra of some telescopic comets. Part of the light from comets is reflected solar light, and another part is light of their own. The spectrum of this light shows the presence in the comet of carbon, possibly in combination with hydrogen.

On the next night, June 25, a second photograph was obtained with an exposure of an hour and a half. This photograph, notwithstanding the longer exposure, is fainter, but shows distinctly the two bright lines and the continuous spectrum, which is too faint to allow the Fraunhofer lines to be seen.

Postscript, July 9, 1881.—I have since measured the photographs of the comet's spectrum, and I find for the two strong bright lines the wave-lengths 3883 and 3870. The less refrangible line is much stronger, and a faint luminosity can be traced from it to a little beyond the second line 3870. There can be, therefore, no doubt that these lines represent the brightest end of the ultra-violet group which appears under certain circumstances in the spectra of the compounds of carbon. Professors Liveing and Dewar have found for the strong line at the beginning of this group the wave-length 3882·7, and for the second line 3870·5.

I am also able to see upon the continuous solar spectrum, a distinct impression of the group of lines between G and *h*, which is usually associated with the group described above. My measures for the less refrangible end of this group give a wave-length of 4230, which agrees as well as can be expected with Professors Liveing and Dewar's measure 4220.

In their paper "On the Spectra of the Compounds of Carbon" (*Proc.* Roy. Soc., vol. xxx. p. 494), Professors Liveing and Dewar show that these two groups indicate the presence of cyanogen, and are not to be seen in the absence of nitrogen. If this be the case, the photograph gives undoubted evidence of the presence of nitrogen in the comet, in addition to the carbon and hydrogen shown to be there by the bright groups in the visible part of the spectrum. On this hypothesis we must further suppose a high temperature in the comet unless the cyanogen is present ready formed.

I should state that Mr. Lockyer regards the two groups in the photograph, and the groups in the visible spectrum, to be due to the vapour of carbon at different heat-levels (*Proc.* Roy. Soc., vol. xxx. p. 461).

It is of importance to mention the strong intensity in the photograph of the lines 3883 and 3870, as compared with the continuous spectrum, and the faint bright group beginning at 4230. At this part of the spectrum, there-

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